I

1.0 SCOPE.

THE PURPOSE OF THIS TEST PLAN IS TO ENSURE THAT THE DESIGN OF THE "LOW-LEVEL FM MULTIPLEXING SYSTEM" COMPLIES WITH THE ENVIRONMENTAL REQUIREMENTS OF BOEING AIRPLANE COMPANY SPECIFICATION REPORT NO. D2-9236.

1.1. THE FOLLOWING COMPONENT PARTS ARE INCLUDED IN THIS PROCEDURE.

------ VCO

----- SUMMING AMPLIFIER

------ REFERENCE OSCILLATOR.

2.0 APPLICABLE DOCUMENTS.

THE FOLLOWING DOCUMENTS AND SPECIFICATIONS FORM PART OF THIS TEST PROCEDURE.

2.1. BOEING AIRPLANE COMPANY SPECIFICATION NO. D2-9236 - LOW-LEVEL FM MULTIPLEXING SYSTEM.

3.0 FACTUAL DATA.

3.1. TOLERANCES.

3.1.1. THE FOLLOWING MAXIMUM ALLOWABLE TOLERANCES WILL PREVAIL DURING ENVIRONMENTAL TESTING.

(a) TEMPERATURE $\pm$ 4° F (EXCLUSIVE OF ACCURACY OF INSTRUMENT)

(b) BAROMETRIC PRESSURE ± 5%

(c) RELATIVE HUMIDITY +5% -0% (OF R.H. VALUE)

(d) VIBRATION AMPLITUDE ± 10%

(e) VIBRATION FREQUENCY ± 2%

(f) ALTITUDE ± 5% (IN FEET)

(g) SHOCK ± 10%

(h) ADDITIONAL TOLERANCES SHALL BE AS SPECIFIED.

3.2. ADJUSTMENTS AND REPAIRS DURING ENVIRONMENTAL TESTS.

3.2.1. THE ONLY ADJUSTMENTS, REPAIRS OR MAINTENANCE PERFORMED DURING TESTS WILL BE THOSE NOT DUE TO THE RESULT OF THE FOLLOWING:

(a) FAULTS IN DESIGN

(b) MATERIALS FAILURE

(c) FAULTY WORKMANSHIP

(d) FAILURE OBVIOUSLY DUE TO TEST CONDITIONS.

3.2.2. ALL MAINTENANCE AND/OR SERVICE REQUIRED MUST BE APPROVED BY THE CONTRACTOR. IN EVENT OF FAILURE DUE TO EXCEEDING THE DESIGNED OPERATING LIFE OF A COMPONENT, THE COMPONENT MAY BE REPLACED AND TEST RESUMED PROVIDED THE UNIT IS THEN TESTED SUFFICIENTLY TO

SATISFY THE JUDGMENT OF THE TESTING AGENCY AND/OR THE CONTRACTOR.

3.3. TEST EQUIPMENT.

3.3.1 MEASURING INSTRUMENTS USED DURING ENVIRONMENTAL TESTS WILL BE OF LABORATORY PRECISION TYPE WITH CALIBRATION STAMP INDICATING PERIOD FOR WHICH THE INSTRUMENT WAS CALIBRATED AND THE LABORATORY PERFORMING THE CALIBRATION.

3.3.2. THE FOLLOWING, OR EQUIVALENT, TEST EQUIPMENT WILL BE REQUIERED TO TO SATISFACTORILY CONDUCT THE TESTS OUTLINED WITHIN THIS PROCEDURE.

3.4. TEST POWER.

115 VOLTS A.C ±10% 60 CPS. ± 2 CPS

3.5. QUALITY PROVISION REQUIREMENT.

3.5.1 A THOROUGH VISUAL AND MANUAL EXAMINATION WILL BE CONDUCTED ON EACH UNIT PRIOR TO ANY TESTS TO DETERMINE THAT THE UNIT MEETS THE REQUIERE-

MENTS OF WORKMANSHIP, MARKING, IDENTIFICATION, FINISH, DIMENSIONS AND CLEANLINESS.

3.5.2. A PRELIMINARY ACCEPTANCE TEST WILL BE PERFORMED ON THE SYSTEM TO VERIFY PROPER OPERATION UNDER STANDARD CONDITIONS AND A RECORD MADE OF ALL THE DATA. THESE DATA SHALL PROVIDE THE CRITERIA FOR CHECKING PERFORMANCE OF THE SYSTEM DURING AND AFTER ENVIRONMENTAL TESTING.

3.6. ATMOSPHERIC CONDITIONS WHERE NOT OTHERWISE SPECIFIED.

(a) TEMPERATURE 77° F. ± 18° F.

(b) HUMIDITY. ROOM AMBIENT UP TO 90% R.H.

(c) BAROMETRIC PRESSURE - NORMAL GROUND 28 TO 32 INCHES Hg

3.7. PROOF CYCLE.

3.7.1. DURING A PROOF CYCLE THE SYSTEM IS OPERATED TO PERMIT PERFORMANCE DATA TO BE OBTAINED, OR INSPECTED VISUALY FOR EVIDENCE OF DETERIORATION. THE PERFORMANCE DATA SHALL BE USED AS THE BASIS FOR COMPARISON FOR THE RESULTS OF TESTS. THESE DATA SHALL BE SATISFACTORILY COMPARABLE TO THAT OBTAINED IN PARAGRAPH 3.5.2.

V

4.0 .TEST PROCEDURE.

THE FOLLOWING PARAGRAPHS OUTLINE THE ENVIRONMENTAL TESTS TO BE CONDUCTED.

4.1 NON-OPERATING TESTS

4.1.1 HIGH AND LOW TEMPERATURE TEST.

4.1.1.1. THE SYSTEM WILL BE PLACED WITHIN THE TEMPERATURE CHAMBER AND THE INTERNAL TEMPERATURE OF THE CHAMBER RAISED TO 125° F WITH AN INTERNAL RELATIVE HUMIDITY OF NOT MORE THAN 15%. THIS CONDITION SHALL BE MAINTAINED FOR A PERIOD OF (48) (2) HOURS.

CHECK on INCORPORATING ALTITUDE HERE

4.1.1.2. THE CHAMBER TEMPERATURE SHALL THEN BE REDUCED TO PREVAILING ROOM CONDITIONS.

4.1.1.3. UPON REACHING TEMPERATURE STABILIZATION, A PROOF CYCLE SHALL BE CONDUCTED.

4.1.1.4. THE CHAMBER TEMPERATURE SHALL NOW BE LOWERED TO −28° F. THIS CONDITION SHALL BE MAINTAINED FOR A PERIOD OF (72) (?) HOURS

4.1.1.5. THE CHAMBER TEMPERATURE SHALL THEN

VI

BE RETURNED TO PREVAILING ROOM
CONDITIONS.

4.1.1.6 - UPON REACHING TEMPERATURE STABILIZATION, A PROOF CYCLE SHALL BE CONDUCTED.

4.1.2 HUMIDITY TEST.

4.1.2.1 THE SYSTEM WILL BE PLACED WITHIN THE TEMPERATURE CHAMBER AND PROVISIONS WILL BE MADE TO PREVENT THE DRIPPING OF MOISTURE ONTO THE EQUIPMENT FROM ABOVE. THE TEMPERATURE OF THE CHAMBER SHALL BE ROOM AMBIENT WITH UNCONTROLLED HUMIDITY.

4.1.2.2. DURING THE FIRST 2 HOUR PERIOD, THE CHAMBER TEMPERATURE WILL BE GRADUALLY RAISED TO 125° F (APPROX. 2 MIN PER 1°) AT THE END OF THIS PERIOD THE RELATIVE HUMIDITY WILL BE INCREASED TO 90%. THESE VALUES OF TEMPERATURE AND HUMIDITY WILL BE MAINTAINED FOR 6 HOURS.

4.1.2.3. DURING THE FOLLOWING 16 HOUR PERIOD THE TEMPERATURE

VII

OF THE CHAMBER WILL BE GRADUALLY RETURNED TO ROOM AMBIENT CONDITIONS, AT WHICH TIME ONE CYCLE OF THE HUMIDITY TEST WILL BE COMPLETED.

4.1.2.4. REPEAT 4.1.2. [illegible] AND CONDUCT A PROBE CHECK OF THE SYSTEM.

4.1.3. SHOCK TEST

4.1.4 VIBRATION (PACKAGE)

4.2. OPERATIONAL TESTS

4.2.1. TEMPERATURE-ALTITUDE.

4.2.1.1 THE SYSTEM WILL BE PLACED WITHIN THE TEMPERATURE-VACUUM CHAMBER. CABLING FOR AC POWER AND TO MONITOR SYSTEM

VIII

PARAMETERS WILL BE MONITORED WITH PROVISIONS FOR SWITCHING OUTSIDE OF CHAMBER.

4.2.1.2. THE TEMPERATURE OF THE CHAMBER WILL BE REDUCED TO +32°F. WHEN THE TEMPERATURE HAS STABILIZED AT LEAST 1 HOUR, THE SYSTEM WILL BE OPERATED AND A 2500 CYCLE CONDUCTED.

4.2.1.3. THE CHAMBER WILL NOW BE EVACUATED TO 20.5" Hg OF MERCURY AND A PROOF CYCLE CONDUCTED ON THE SYSTEM. (NOTE: THE SYSTEM MAY REMAIN OPERATING WHILE CHANGES ARE BEING MADE IN TEMPERATURE AND ALTITUDE TO SAVE TIME IF NECESSARY).

4.2.1.4. THE CHAMBER WILL NOW BE EVACUATED TO 13.76 Hg OF MERCURY AND HELD AT THIS PRESSURE FOR A PERIOD OF 1 HOUR AT WHICH TIME A PROOF CYCLE WILL BE CONDUCTED.

4.2.1.5. THE TEMPERATURE AND PRESSURE GRADUALLY OF THE CHAMBER WILL BE RESTORED TO ROOM AMBIENT. S WHEN CONDITIONS IN THE CHAMBER HAVE STABILIZED A PROOF CYCLE WILL BE CONDUCTED.

4.2.1.6. THE CHAMBER TEMPERATURE WILL NOW BE RAISED TO 140°F AT ATMOSPHERIC CONDITIONS. AFTER A PERIOD OF ONE HOUR OR WHEN THE CHAMBER HAS STABILIZE A PROOF CYCLE WILL BE CONDUCTED.

4.2.1.7. THE CHAMBER PRESSURE WILL BE REDUCED TO 20.52 Hg. OF MERCURY AND A PROOF CYCLE CONDUCTED.

4.2.1.8. THE PRESSURE WILL NOW BE CHANGED TO 13.76 Hg. OF MERCURY AND HELD AT THESE CONDITIONS FOR ONE HOUR. AT THE END OF THIS PERIOD A PROOF CYCLE WILL BE CONDUCTED.

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4.2.1.4. THE TEMPERATURE AND DEGREE OF RELATIVE HUMIDITY SHALL BE GRADUALLY ADJUSTED TO THE AMBIENT CONDITIONS IN THE CHAMBER. ONE STABILIZED A PROOF CYCLE WILL BE CONDUCTED.

4.2.2. HUMIDITY TEST.

4.2.2.1 THE SYSTEM WITH THE NECESSARY CABLES FOR THE TEST WILL BE PLACED WITHIN THE TEMPERATURE CHAMBER AND REGULATIONS WILL BE MADE TO PRESENT THE DEGREE OF MOISTURE INTO THE CHAMBER FROM ABOVE.

4.2.2.2 DURING THE FIRST TWO HOURS, THE CHAMBER DEGREE OF MOISTURE WILL BE GRADUALLY RAISED TO 95% R.H. THE RELATIVE HUMIDITY THROUGHOUT THIS TEST WILL BE TYPICAL 45%, WITH A MAXIMUM LIMIT OF 90%.

4.2.2.3. THE CHAMBER WILL BE MAINTAINED IN THE ABOVE CONDITIONES FOR A PERIOD OF 6 HOURS, AT WHICH TIME A PROOF CYCLE WILL BE CONDUCTED.

4.2.2.4. DURING THE FOLLOWING 16 HOURS THE TEMPERATURE AND RELATIVE HUMIDITY WILL BE REDUCED TO ROOM AMBIENT CONDITIONS. AT LEAST 3 PROOF CYCLES WILL BE CONDUCTED DURING THIS PERIOD OF TIME.

4.2.3. VIBRATION TEST

4.2.3.1. THE SYSTEM WILL BE MOUNTED TO THE SHAKE TABLE LOCATING THE CENTER OF GRAVITY AS NEAR THE CENTER OF THE PLATFORM AS PRACTICAL.

4.2.3.2. POWER AND MONITORING EQUIPMENT WILL NOW BE APPLIED TO THE SYSTEM. ALLOW 5 MINUTES WARMUP.

4.2.3.3. THE SYSTEM WILL BE VIBRATED IN THE THREE MAJOR AXES IN A 1/2 OCTAVE PER MINUTE SWEEP RATE FROM 5CPS TO 2000 CPS, TWIECE UPWARDS AND TWICE DOWNWARDS IN 44 MINUTES PER AXIS. IT SHALL BE CONSTANT AMPLITUDE OF 0.5 INCHES PEAK TO PEAK FROM 5 TO 12 CPS AND CONSTANT ± 3 g. PEAK FROM 12 TO 500 CPS. DURING THE SWEEP PERIOD THE SYSTEM OUTPUTS - SHALL BE RECORDED.

4.2.4 <u>SHOCK TEST</u>